

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 107 622 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.06.2001 Bulletin 2001/24

(51) Int Cl.7: H04Q 7/30, H04Q 7/38

(21) Application number: 00308856.4

(22) Date of filing: 09.10.2000

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU

MC NL PT SE

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: 10.12.1999 EP 99309986

(71) Applicant: LUCENT TECHNOLOGIES INC.
Murray Hill, New Jersey 07974-0636 (US)

(72) Inventors:

- Costa, Mauro
Casteggio 27045, Pavia (IT)

- Roberts, Michael
Southend-on-Sea, SS2 5EB (GB)
- Sivagnanasundaram, Sutha
Tooting, SW17 4EJ (GB)

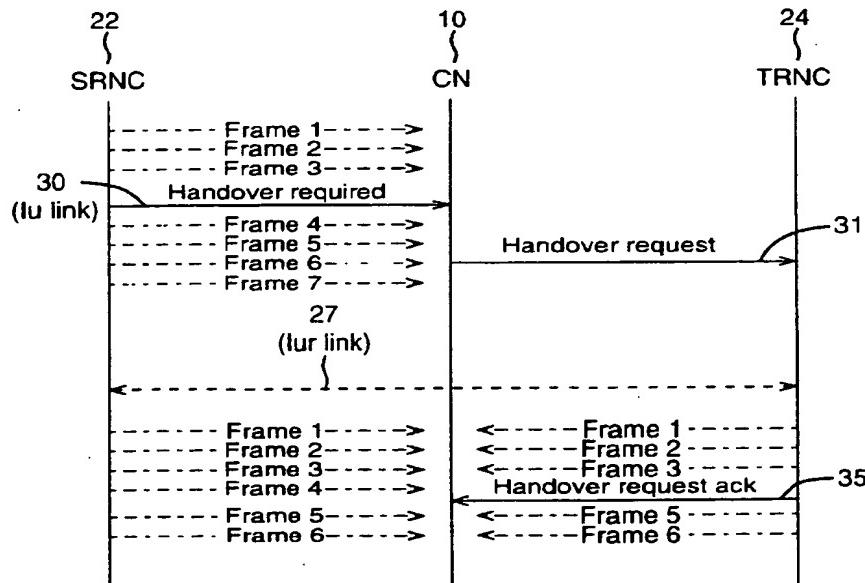
(74) Representative:
Watts, Christopher Malcolm Kelway, Dr. et al
Lucent Technologies (UK) Ltd,
5 Mornington Road
Woodford Green Essex, IG8 0TU (GB)

(54) Mobile radio system with synchronised handover

(57) In a mobile radio network such as the Universal Mobile Telephone System. Handover or relocation of control of a mobile from a serving RNC 22 to a target RNC 24. The TRNC 24 sends a request to the SRNC 22 over the Iur link 27, and the SRNC 22 returns frame

timing information . The TRNC 24 synchronizes the user plane with the SRNC for this uplink, so that both controllers are able to send the same packets in synchronism. The core network (10) can suppress the duplicated packet.

FIG. 3



EP 1 107 622 A1

turns a handover request acknowledgement 35, and the CN 10 performs a handover. With frames now passing via RNC 24, synchronisation is eventually reached, but there is often a noticeable loss or duplication of packets which is perceived by the application and causes noticeable disturbance to the application, for example, in a video, a loss of synchronisation and/or a jittering display.

[0018] In the method of the invention, when the TRNC 24 receives the handover request signal from the CN 10, it sends over the Iur link 27 a request for timing information from the SRNC 22 related to its frames; the SRNC 22 then sends over the link Iur 27 its low layer timing and synchronisation and protocol; provisioning timing offset; and synchronisation information. The signals are illustrated in Figure 2.

[0019] Once synchronisation information is exchanged, the two RNCs 22, 24 are able to send synchronously the same packet from the mobile in cell 32/34 on the Lu interface links 30,31 to the CN 10. The TRNC 24 sends the Handover Request Acknowledgement signal. The CN 10 can then permit the handover or relocation to RNC 24.

[0020] During the handover or relocation, the CN 10 is able to determine which packets are being repeated, and to suppress the repetition.

[0021] The signals send over the Iur link 27 maybe out-of-band, but for minimum delay, in-band signalling is preferred.

[0022] It is to be understood that Iur link is at present used by the SRNC 22 to send a request to the TRNC 24; in the inventive method, the TRNC 24 sends a request in the opposite direction to that conventionally used, and considerable additional information is then sent over the link.

[0023] Figure 3 shows the counting of Lu frames in the user plane and indicates the signal paths.

[0024] The SRNC 22 sends frames, shown chain-dotted, to the CN 10 via the Lu uplink user plane; the SRNC also sends the "handover required" signal to the CN via Lu signalling, shown by a full line. The CN sends the "handover request" signal to the TRNC via Lu signalling (full line) 31.

[0025] The low level timing and synchronisation of the Lu signals are sent via the Iur link 27, shown dotted. The TRNC changes its timing for the mobile in cell 32/34 only to come into synchronisation with the SRNC.

[0026] Subsequently the SRNC and the TRNC both send frames from the mobile in cell 32/34; it will be seen from Figure 3 that frames 1 and 2 are not synchronised; frames 3 are synchronised, and the TRNC can then send its "handover request acknowledgement" signal 35 to the CN via Lu signalling (full line). Frames 5 and 6 are shown to be synchronised, and sent by both RNCs. The CN 10 prevents repetition of the information.

[0027] The method of the invention, of sequencing/synchronisation on the Lu interface, allows the CN 10 to perform near lossless switching between two uplink packet streams. Quality of Service on handover is great-

ly improved.

[0028] The inventive method can be applied to relocation as well as to RNC handover, and can be applied to GSM as well as to UMTS.

5 [0029] As is conventional, the CN 10 comprises at least one Mobile Switching Centre (MSC) and a plurality of GSM Support Nodes, one of which will be the Serving GSM Support Node (SGSN) for a call in progress.

10

Claims

15 1. In a mobile radio telecommunications system, a method of handing over control of a mobile from a serving controller (22) to a target controller (24), characterised by the steps of:-

20 the target controller sending to the serving controller a request for timing information; the serving controller sending timing information to the target controller; the target controller coming into user plane synchronisation with the serving controller for this mobile connection; and the target controller taking control of the mobile.

25 2. A method according to Claim 1 in which the serving controller (22) sends to the target controller (24) frame information relating to packets on the uplink.

30 3. A method according to any preceding Claim in which the target and serving controllers come into synchronisation on their Lu interface (12) with the core network (10) of the system.

35 4. A method according to Claim 2 in which the frame information is low layer timing and synchronisation protocol, provisioning timing offset, and synchronisation information.

40 5. A method according to Claim 2 or Claim 4 in which the target radio network controller (24) sends said request to the serving radio network controller (22) over an Iur link (27) between the controllers and the serving radio network controller (22) sends the frame information over said Iur link (27).

45 6. A controller (22 or 24) for a mobile radio telecommunications system arranged, on handover of control of a mobile to that controller (24), to send a request for timing information to a serving controller (22); to receive timing information from the serving controller; to come into user plane synchronisation with the serving controller (22) for this mobile connection; and to take control of the mobile; and further arranged, on handover of control from that controller (22) to a target controller (24) and on receipt of a request signal, to send to that target controller

signal timing information.

7. A controller (22 or 24) according to Claim 6 in which the controller (22) is arranged to send to said target controller (24) frame information relating to packets on the uplink. 5
8. A controller (22 or 24) according to Claim 6 or Claim 7 arranged to come into synchronisation on the Iu interface (31) with a core network (10). 10
9. A controller (22 or 24) according to any one of Claims 6, 7 or 8 arranged to send and receive low layer timing and synchronisation and protocol information; provisioning timing offset; and synchronisation information. 15
10. A controller according to any one of Claims 6 to 9 which is a radio network controller (22,24) for a UMTS network. 20
11. A controller according to any one of Claims 6 to 9 which is a Base Station Controller for the GSM network. 25
12. A controller according to any one of Claims 6 to 9 which is a Serving GSM Support Node for a Core Network (10).
13. A controller according to any one of Claims 6 to 9 which is a Mobile Switching Centre for a Core Network.(10). 30

35

40

45

50

55

4

FIG. 1

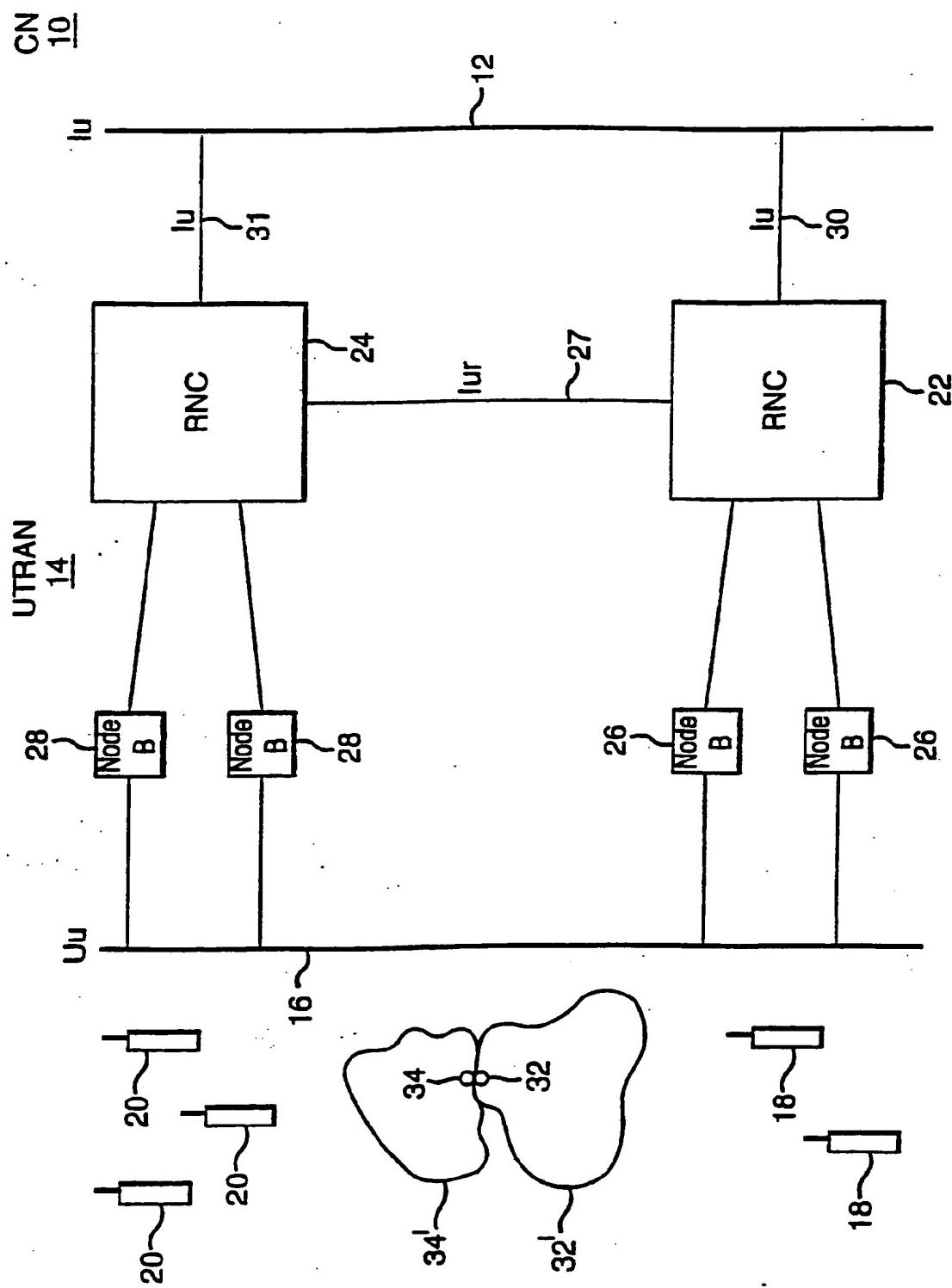


FIG. 2

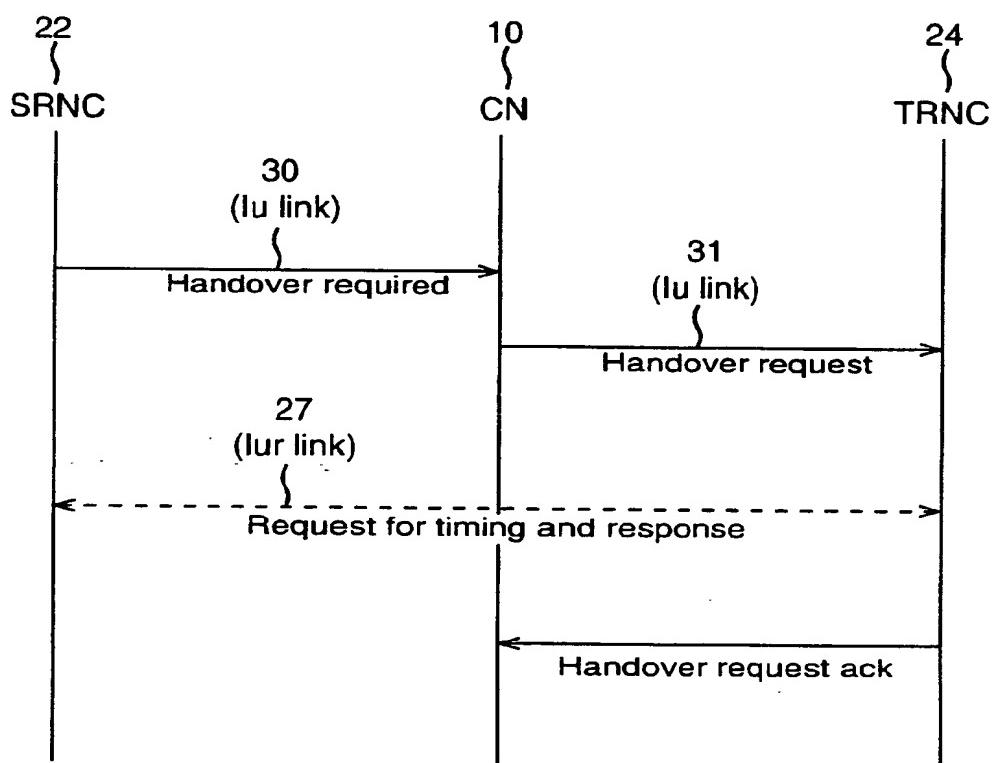
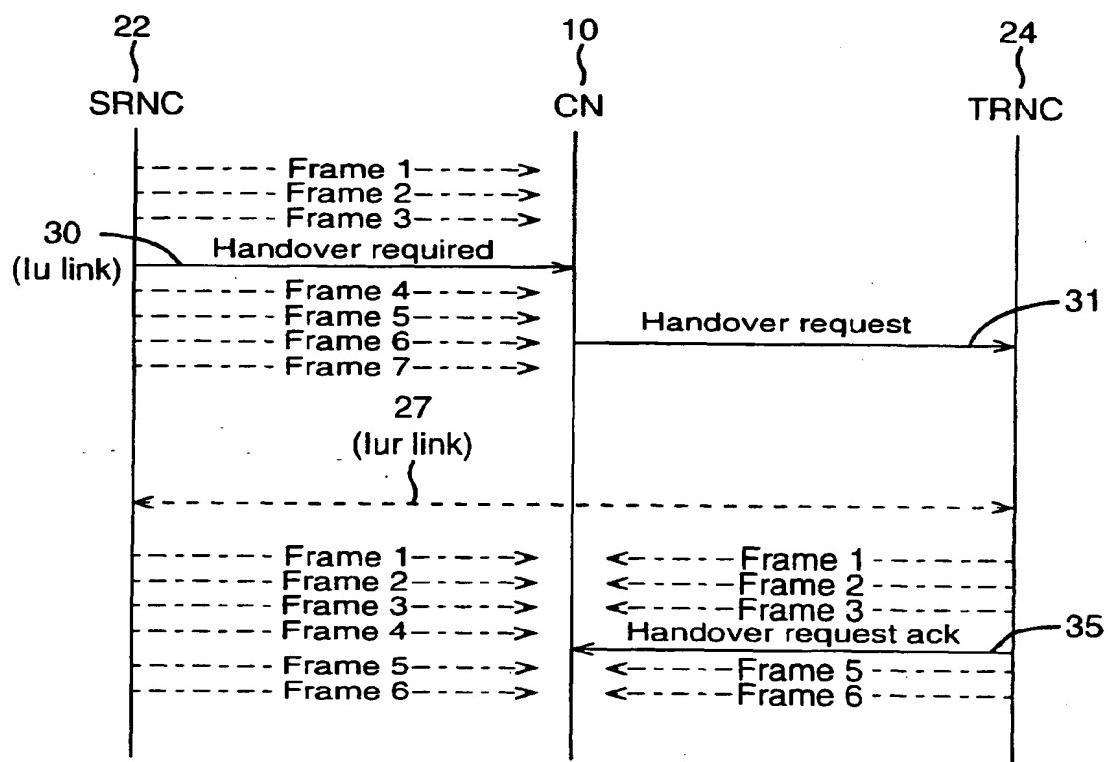


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 8856

DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)																			
X	WO 96 38990 A (FLAKE HORST ; IDE HANS DIETER (DE); NEUHAUS RALF (DE); PAULI BURKHA) 5 December 1996 (1996-12-05) * page 8, line 31 - page 9, line 5 * * page 11, line 31 - page 12, line 15 * * page 13, line 26 - page 15, line 10 *	1,3,6,8, 10-13	H04Q7/30 H04Q7/38																			
Y	EP 0 676 908 A (OKI ELECTRIC IND CO LTD) 11 October 1995 (1995-10-11) * column 4, line 10 - line 38 *	5																				
X	EP 0 676 908 A (OKI ELECTRIC IND CO LTD) 11 October 1995 (1995-10-11) * column 4, line 10 - line 38 *	1,2,4,6, 7,9-13																				
A	KALLIOKULJU J: "Quality of service management functions in 3/sup rd/generation mobile telecommunication networks" WCNC. 1999 IEEE WIRELESS COMMUNICATIONS AND NETWORKING CONFERENCE (CAT. NO.99TH8466), WCNC. 1999 IEEE WIRELESS COMMUNICATIONS AND NETWORKING CONFERENCE, NEW ORLEANS, LA, USA, 21-24 SEPT. 1999, pages 1283-1287 vol.3, XP002163144 1999, Piscataway, NJ, USA, IEEE, USA ISBN: 0-7803-5668-3 * page 1285, paragraph IV - page 1287, paragraph V *	1-13																				
TECHNICAL FIELDS SEARCHED (Int.Cl.7)																						
H04Q H04B																						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 33%;">Examiner:</td> </tr> <tr> <td>BERLIN</td> <td>19 March 2001</td> <td>Palencia Gutiérrez,C</td> </tr> <tr> <td colspan="3"> CATALOGUE OF CITED DOCUMENTS <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">X : particularly relevant if taken alone</td> <td style="width: 70%;">T : theory or principle underlying the invention</td> </tr> <tr> <td>Y : particularly relevant if combined with another document of the same category</td> <td>E : earlier patent document, but published on, or after the filing date</td> </tr> <tr> <td>A : technological background</td> <td>D : document cited in the application</td> </tr> <tr> <td>O : non-written disclosure</td> <td>L : document cited for other reasons</td> </tr> <tr> <td>P : intermediate document</td> <td>& : member of the same patent family, corresponding document</td> </tr> </table> </td> </tr> </table>				Place of search	Date of completion of the search	Examiner:	BERLIN	19 March 2001	Palencia Gutiérrez,C	CATALOGUE OF CITED DOCUMENTS <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">X : particularly relevant if taken alone</td> <td style="width: 70%;">T : theory or principle underlying the invention</td> </tr> <tr> <td>Y : particularly relevant if combined with another document of the same category</td> <td>E : earlier patent document, but published on, or after the filing date</td> </tr> <tr> <td>A : technological background</td> <td>D : document cited in the application</td> </tr> <tr> <td>O : non-written disclosure</td> <td>L : document cited for other reasons</td> </tr> <tr> <td>P : intermediate document</td> <td>& : member of the same patent family, corresponding document</td> </tr> </table>			X : particularly relevant if taken alone	T : theory or principle underlying the invention	Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date	A : technological background	D : document cited in the application	O : non-written disclosure	L : document cited for other reasons	P : intermediate document	& : member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner:																				
BERLIN	19 March 2001	Palencia Gutiérrez,C																				
CATALOGUE OF CITED DOCUMENTS <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">X : particularly relevant if taken alone</td> <td style="width: 70%;">T : theory or principle underlying the invention</td> </tr> <tr> <td>Y : particularly relevant if combined with another document of the same category</td> <td>E : earlier patent document, but published on, or after the filing date</td> </tr> <tr> <td>A : technological background</td> <td>D : document cited in the application</td> </tr> <tr> <td>O : non-written disclosure</td> <td>L : document cited for other reasons</td> </tr> <tr> <td>P : intermediate document</td> <td>& : member of the same patent family, corresponding document</td> </tr> </table>			X : particularly relevant if taken alone	T : theory or principle underlying the invention	Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date	A : technological background	D : document cited in the application	O : non-written disclosure	L : document cited for other reasons	P : intermediate document	& : member of the same patent family, corresponding document										
X : particularly relevant if taken alone	T : theory or principle underlying the invention																					
Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date																					
A : technological background	D : document cited in the application																					
O : non-written disclosure	L : document cited for other reasons																					
P : intermediate document	& : member of the same patent family, corresponding document																					

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 8856

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-03-2001

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 9638990	A	05-12-1996		AU 5810696 A CN 1185885 A DE 59603171 D EP 0829172 A ES 2138349 T JP 10506775 T		18-12-1996 24-06-1998 28-10-1999 18-03-1998 01-01-2000 30-06-1998
EP 0676908	A	11-10-1995		JP 7284141 A CA 2146493 A US 5677908 A		27-10-1995 09-10-1995 14-10-1997

EPO FORM P1455

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82